7. DISCUSSION

While the Small Streams Toxicity/Pesticide Study was not designed to determine the cause of observed toxicity, a weight-of-evidence approach using the data collected for this study may allow some understanding of causality. Below, the results of toxicity tests are compared to contaminant concentrations detected above threshold effects levels for each study stream.

7.1. Lyon Creek

Toxicity was first observed for all three species tested (*C. dubia, S. capricornutum*, and *L. minor*) for Lyon Creek in May 1998. For this sample, the HQs for diazinon and simazine were 4.72 and 16.25, respectively. Hazard quotients greater than 1 suggest these chemicals may have contributed to the toxicity observed in the sample. The *S. capricornutum* tests were conducted with both filtered and unfiltered samples. Filtering removed the observed toxicity suggesting the toxicant(s) were associated with particulates in the sample.

In spring 1999, no toxicity was observed during tests using *C. dubia.* However, toxicity to *S. capricornutum* was observed. Diazinon, simazine, and copper concentrations for this sample resulted in HQs of 2.16, 3.35, and 1.13, respectively, suggesting these compounds may have contributed to the observed toxicity. Again, filtering removed the observed toxicity, suggesting toxicant(s) were associated with particulates in the sample. In the case of copper, however, dissolved metal concentrations represent the acutely toxic fraction (Bergman and King 1997, Hamelik et al. 1994, Prothro 1993). In other words, for copper to cause toxicity within the test duration used for *S. capricornutum* (96 hours), it would need to be dissolved. Dissolved copper would still be present in a filtered sample; therefore, it is unlikely that copper contributed to the observed toxicity.

No toxicity was observed for any of the species tested in summer 1999, and no HQs exceeded 1.0. However, toxicity to *S. capricornutum* was observed in fall 1999 without organic or metallic parameters resulting in HQs of greater than 1. Therefore, the cause of toxicity is unknown. Conversely, no toxicity was observed in late fall 1999; however, 4,4'-DDT and aluminum concentrations resulted in HQs greater than 1. This suggests that other factors (e.g., reduced bioavailability) are likely reducing the toxicity of these chemicals.

7.2. Lewis Creek

In the spring of 1999, toxicity to *S. capricornutum* was observed in the unfiltered sample, but not in the filtered sample. No metal or pesticide concentrations resulted in HQs greater than 1 in samples collected during this sampling event; therefore, the cause of toxicity is unknown.

7.3. Juanita Creek

In the spring of 1999, toxicity to *S. capricornutum* was observed. Hazard Quotients were 2.02 for diazinon, 1.52 for cobalt, 2.02 for copper, and 1.35 for lead. Filtering appeared to remove some of the toxicity observed in this sample but did not remove all (see Section 3). This suggests that more than one toxicant was present and that the toxicants were both dissolved and adsorbed to particulates. This corresponds to the HQ exceedances by diazinon, copper, lead, and cobalt, suggesting these contaminants may have contributed to the observed toxicity.

In summer 1999 testing, toxicity to *S. capricornutum* was observed in the unfiltered sample, but not in the filtered sample. Hazard quotients exceeded 1.0 for copper (1.88). Again, since no toxicity was observed in the filtered sample, suggesting the toxicant(s) were present in the particulate phase and not in the dissolved phased, it is unlikely copper contributed to the observed toxicity. In the fall of 1999, toxicity to *S. capricornutum* was observed in the unfiltered sample. The HQ for diazinon was 1.99, suggesting this compound may have contributed to the observed toxicity. No toxicity was observed in late fall of 1999; however, the 4,4'-DDT concentration resulted in an HQ of 2.4.

7.4. Rock Creek

Toxicity to *C. dubia* was observed in the spring 1999 with the filtered sample. However, this may have been an artifact of low nutrients and/or hardness (see Section 3). HQs for chemicals measured in Rock Creek samples never exceeded 1.0. No toxicity was observed in tests conducted with the summer, fall and late fall samples.

Overall, in all creeks tested in 1999, some pesticide and metal concentrations resulted in HQs greater than 1 and toxicity was observed in the corresponding toxicity tests. However, concentrations resulting in HQs greater than 1 did not always correspond with observed toxicity. Conversely, some observed toxicity did not correspond with contaminant concentrations resulting in HQs greater than 1. Given the disparity between observed toxicity and the results of comparisons of contaminant concentrations with effects thresholds, the cause of toxicity observed in these small streams remains uncertain.